

## THE SURGICAL TREATMENT OF EXOPHTHALMIC GOITRE.<sup>1</sup>

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It is now nearly a century since exophthalmic goitre was first described by Caleb Parry and seventy years since Graves wrote his classical essay upon the subject, and yet the treatment of the disease has never been satisfactory, in most instances merely alleviating the symptoms. The clinical picture of exophthalmic goitre is so typical that the diagnosis is always easily made unless exophthalmos is absent, when careful inquiry of the early symptoms and course should correct any doubt as to the true condition.

Miss A. B., aged twenty-four years, referred to me by Dr. Charles K. Ladd, of Towanda, Pa., was admitted to the German Hospital on December 30, 1902. The family history is quite interesting; her father is living and well, but is frequently nervous and irritable; her grandmother and mother died from heart trouble, and were also of nervous temperaments. A brother died from heart disease, chorea, and rheumatism. She had measles, whooping-cough, and varicella when a child; menstruated first at fourteen, continuing regular and without dysmenorrhœa until last summer, when she missed several periods. There is a history of frequent convulsions up to the age of eight, but their nature could not be determined. At the time of beginning menstruation there was distinct enlargement of the thyroid gland, lasting about one year and disappearing under the use of electricity. There was no palpitation nor dyspnoea at this time, but she had a number of fainting spells. She suffered from slight rheumatic attacks during girlhood.

Four years ago the thyroid gland became enlarged and the eyeballs prominent, with attacks of indigestion, abdominal colic,

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and nervousness. The goitre continued with a gradual increase in the symptoms of indigestion until March, 1902, when the entire symptom complex of exophthalmic goitre manifested itself. Her neck increased in size, with resulting dyspnoea and inability to wear a collar or anything tight around the neck; she became nervous, irritable, and easily upset; worried over trifles, always anxious to finish anything undertaken, and restless until the task was finished. Palpitation of the heart was present and increased by exertion. She became breathless and weak after climbing stairs, and suffered from frequent spells of profuse perspiration over the entire body, most marked over the chest, neck, and arms.

Her appetite became capricious, and for two months she suffered from diarrhoea. There has never been any jaundice present. These symptoms have been continuous until admission, when the following observations were made:

The eyes are prominent, easily irritated with frequent lachrymation, widely dilated pupils, and an injected conjunctiva; winking is infrequent. The palpebral angle is widened, but the sclera is not visible below the upper lid, and the lid readily follows the movements of the eye. No lagophthalmos can be observed, nor is there corrugation or wrinkling of the eyebrows when the patient looks up. There is slight internal convergence.

The thyroid is symmetrically enlarged, without a thrill, and by auscultation a venous hum can be heard over the struma and the carotid vessels. Slight hoarseness is present, the patient's voice becoming husky after talking to any extent. Tachycardia is present with arrhythmia.

The pulse averages 120 when quiet, but increases with the slightest exertion up to 160. The apex beat is in the fifth interspace, diffuse, and seen beyond the nipple; the impulse is moderately forcible, and a slight initial systolic murmur can be heard, transmitted to the axilla.

The lungs and abdomen were negative. A tremor of the fingers can be seen upon extension of the hand, especially noticeable when the patient becomes excited.

There was no polyuria, the urine containing a trace of albumen, but no sugar or casts. The blood count showed no anemia, with 10,320 leucocytes and an eosinophile of 10.5 per cent. The temperature was always normal before operation, the respirations ranging from 20 to 24.

One week after admission, bilateral resection of the cervical sympathetics was performed under ether anaesthesia. An incision five inches long was made along the posterior border of the right sternomastoid muscle, which was reflected forward along with the great vessels and pneumogastric nerve. The sympathetic nerve and its three ganglia were found and removed entire from a point one-half inch above the superior ganglion to one-half inch below the inferior ganglion. The middle ganglion was located as lying upon the inferior thyroid artery, the inferior ganglion being behind the subclavian artery. After checking all hæmorrhage, the wound was closed with a continuous silk suture and a collodion dressing applied.

The operation was repeated on the left side, the middle ganglion being found just above the inferior thyroid artery and the inferior ganglion just below the same blood-vessel. On account of the high position of the lower ganglion, the nerve was cut well below it, in order to remove the entire origin of the inferior cardiac nerve. Silk sutures and a collodion dressing closed this wound also.

Patient took ether badly from the start; was cyanosed and full of mucus; had some trouble with nasopharynx previous to operation. Operation was interrupted several times on account of the anaesthetic. At completion of operation the patient's color was very bad and pulse rapid and irregular; was given oxygen for an hour after operation. On coming out of the anaesthetic she vomited clear mucus in gushes. Commenced cough almost at once, and cough continued, accompanied by intermittent expectoration of large quantities of seromucus. Several hours after operation both lungs were noted to be full of moist bubbling râles, and respiration was labored and harsh. Patient remained cyanotic, and received oxygen at fifteen-minute intervals for several days. The day following operation she was bled from left arm and lungs cupped posteriorly. Both bases flat. Patient remained cyanotic and with rapid pulse for several days. Symptoms gradually subsided, and patient made satisfactory recovery.

The immediate benefit of the operation to the tachycardia could not, unfortunately, be observed, as the patient developed a severe pneumonia twelve hours after the operation, and for several days she was in a perilous condition, the temperature reaching 105° F. and slowly declining, reaching the normal seven days after operation.

The exophthalmos was noticed to have disappeared almost entirely twenty-four hours after the operation, and, after her recovery from the lung condition, convalescence was rapid. The wound healed by first intention, and on January 31, twenty-six days after operation, the patient was discharged, with no appreciable exophthalmos and with entire disappearance of all nervous symptoms. The goitre, though diminishing, was still present, but causing no discomfort. On February 26 the patient writes that she is quite well and markedly improved by the operation.

The underlying causes of exophthalmic goitre are obscure and subject to much debate; whether a direct or reflex stimulation of the sympathetic, a neurosis, a lesion, a compression, or an intoxication has not definitely been determined. The progress in the study of the internal secretion of this gland, like all the other ductless glands, has been slow, and has not furnished a satisfactory cause beyond the probable alteration of the secretion.

At the present time three theories are advanced, viz., hyperthyroidization, disease of the central nervous system, or alteration in the sympathetic system.

The arguments in favor of a lesion of the thyroid gland itself are mainly based on the failure to find reliable post-mortem evidence of disease of the nervous system, and the altered secretion of the thyroid is supposed to exert a direct or indirect toxic action upon the heart, nervous system, and general nutrition, the exophthalmos being caused by a local deposit of fat behind the eyeball. Mikulicz and Reinbach believe that while the presence of Basedow's disease cannot be explained by an excessive function of the thyroid, yet the hypertrophy of this gland plays a prominent rôle by adding the phenomena of thyroidism to the other symptoms. The failure of thyroidectomy is therefore to be ascribed to the fact that, in spite of the removal of this factor, the primary injury, viz., the nerve lesion, is sufficiently severe to render the phenomena of the disease continuous. The influences of heredity, age, sex, and temperament tend with remarkable unanimity to point to a nervous origin.

The tachycardia, hyperidrosis, tremor, decrease of electrical resistance, and general nervous unrest which are so constantly present would also denote a nerve influence. There are some cases, also, in which the enlargement of the thyroid is very slight or even absent.

For the present, at least, we must assume that exophthalmic goitre is dependent upon all these factors, and that a lesion of one may cause specific alterations in the others, with the production of the well-marked symptoms denoting the disease.

The diagnosis from simple parenchymatous goitre must be made in those cases where the exophthalmos is absent, particularly when the ordinary form of goitre is accompanied by cardiovascular symptoms. The most marked points in which the simple goitre differs are the irregularity of the position of the enlarged thyroid, the direct pressure upon the trachea from the size of the growth with dyspnoea and stridor, and the more mild character of the nervous and vascular phenomena if present together, of course with the absence of the exophthalmos.

The treatment of Graves's disease with drugs is unsatisfactory, and all like diseases, the medical cure of which has been unsuccessful, the number of so-called curative remedies is a large one. Digitalis, belladonna, bromine preparations, iron, and various nerve sedatives have been most frequently used.

Electricity, galvanic and faradic, has been tried without any benefit; iodine and thyroid feeding aggravate the symptoms.

There are four surgical procedures adopted:

1. Partial thyroidectomy.
2. Ligature of the thyroid vessels.
3. Operations upon the cervical sympathetic nerves.
4. Operations upon distant parts of the body.

In addition to these operations, exothyropexy has sometimes been employed, performed by exposing the gland and drawing it out of the wound and leaving it exposed to the

air. Atrophy is supposed to result, but the operation is dangerous, ineffectual, and very disfiguring.

Thyroidectomy has been the operation usually performed for the relief of exophthalmic goitre, especially when the cause is believed to be hypersecretion of the thyroid epithelium. It must be admitted that this operation has furnished good results, especially in the hands of Kocher, but the mortality has been very high. Starr, Sargo, and Iricomi have published statistics up to 1896 with a mortality varying between 12 and 15 per cent. and a cure obtained from 25 to 39 per cent. Partial resection has been the method used, because, unlike the simple goitre, that in Graves's disease cannot be enucleated. *Ætherization* of these patients is difficult and fraught with danger, especially from a postoperative pneumonia, and Kocher, recognizing this fact, always uses local anæsthesia. The escape of the thyroid secretion over the cut surfaces during the removal has been believed to aid in the production of a postoperative thyroid intoxication.

Ligature of the thyroid vessels has been tried, especially by Kocher, in the hope that by cutting off the blood supply the gland will undergo atrophy. The exposure of the inferior thyroid vessels may be a difficult task. Kocher usually ties off both superior and one inferior thyroid artery, and frequently combined this operation with partial resection of the gland or resection of the cervical sympathetics in severe cases; the combined operations are often performed in several sittings.

Section of the cervical sympathetic for exophthalmic goitre was first performed by Jaboulay, of Lyons, in 1896, and later in the same year, Jonnesco, of Bucharest, resected part of the nerve together with the superior cervical ganglion. The results were not sufficient, however, and Jonnesco and others extended the operation until complete bilateral excision of the entire cervical sympathetic nerve with its three ganglia, and even in some cases the upper thoracic ganglion, was advocated.

The theory upon which the operation is based presupposes

the nervous origin of the disease with alteration of the sympathetic nerve. Each of the three cardinal and also the subsidiary symptoms are believed to be dependent upon stimulation of this nerve. Exophthalmos is caused by a stimulation of the cervical sympathetic leading to an energetic contraction of Müller's smooth muscle at the posterior pole of the bulb, the dilatation of the pupil is due to the same irritation of the cervical sympathetic which communicates with the lenticular ganglion and its ciliary branches to the iris.

The goitre depends either upon an enormous dilatation of the vessels of the thyroid from stimulation of the vasodilator fibres of the neck, or, as Jonnesco believes, it is due to an increased activity of the thyroid epithelium with hypersecretions which are dependent upon the permanent stimulation of the secretory nerve-fibres of the thyroid. Resection of the sympathetic, and consequently of the vasodilator, vasoconstrictor, and secretory nerve-fibres, results in atrophy of the thyroid.

Tachycardia is likewise to be attributed to the irritation of the sympathetic which communicates with the cardiac plexuses by several branches, the accelerator nerves of the heart muscle.

The nervous and digestive phenomena are dependent upon changes in the cerebral circulation, possibly a permanent cerebral anaemia produced by a continuous stimulation of the vasoconstrictor fibres of the cervical sympathetic. The vertebral nerve containing a number of vasomotor filaments is given off from the inferior ganglion. Removal of these fibres produces cerebral congestion.

The various operations on the cervical sympathetic for the relief of exophthalmic goitre are the following: (1) Simple division of the cervical sympathetic; (2) ablation of the cervical sympathetic by means of Jaboulay's operation, which, without a large incision, is devised to stretch and twist the nerve by means of forceps attached to its upper and lower ends; (3) simple stretching the cervical sympathetic; (4) partial resection of the latter; (5) partial and extensive resection; and (6) total resection.

Bellescue believes that extensive *partial* resection is only indicated in the cases of Basedow's disease in which the tachycardia is not intense. He believes that the entire bilateral resection with removal of the uppermost thoracic ganglion is easy of performance and harmless in its results, with a far greater percentage of cures than any other operation for the relief of exophthalmic goitre, and practically no mortality.

His statistics show 59 per cent. of cures, 29 per cent. of improvements, and 12 per cent. of failures, with no deaths directly due to the operation.

Jonnesco is also very enthusiastic, having performed over 130 bilateral sympathectomies in the last five years, in two cases removing the first thoracic ganglion. He has not observed in any of these cases any trophic or circulatory disturbances. Of this series, fifteen were performed upon patients suffering with exophthalmic goitre, with a complete cure or marked improvement. The three cardinal symptoms of the disease disappeared completely, nutrition became normal, and the nervous condition was restored to its original stability.

The operation should not be undertaken unless the surgeon is perfectly familiar with the anatomy of the area of operation and able to cope with any anomaly in the course of the nerve or the position of its ganglia. The difficulties encountered during anaesthesia are similar to those in all operations upon the thyroid, and require the careful attention of the anaesthetist at all times.

In severe cases with marked exophthalmos and pronounced nervous irritation, the operation may be performed in two sittings about a fortnight apart, removing one side at each sitting. This undoubtedly insures a more successful result.

In addition to exophthalmic goitre, cervical sympathectomy has furnished excellent results in chronic glaucoma. Jonnesco was the originator, and has collected thirty-five cases, twelve his own, with marked improvement in all but about six cases.

Suker has collected twelve cases, operated upon in this country, with removal of the superior cervical ganglion, with good results, and believes the operation should be performed



in absolute and hæmorrhagic glaucoma; in chronic glaucoma, especially when an iridectomy or sclerotomy has failed, and at all times when other operative measures are refused, irrespective of the form of glaucoma.

The removal of the ganglion causes: (1) Contraction of the iris, (2) relaxation of the circumbulbar muscle, (3) vascular dilatation, (4) lower intraocular tension, and (5) a decrease in the elements constituting the aqueous.

Only the side affected should be operated upon. Jonnesco has also obtained brilliant results in epilepsy by resection of the sympathetics, on the hypothesis that epileptic attacks are due to cerebral anæmia from irritation of the cervical sympathetics with narrowing of the lumen of the cerebral blood-vessels. "Section of the cervical sympathetics by cutting off the avenue through which such impulses are carried prevents the occurrence of brain anæmia, and so permits the uniform and constant nutrition of brain tissues on which cerebral stability depends. The section of the cervical sympathetic also seems to act favorably by preventing the flood of nervous impulse or reflexes from irritated abdominal or pelvic organs to the brain." (Jonnesco.)

Jonnesco has operated on over 100 epileptics, and records the results for 1896, '97, and '98.

During these years forty-nine were operated upon, with twelve cures and four improvements. These results are accurate, because they have been frequently observed after operation, and he does not regard any of his results as definitive until at least two years have passed.

In migraine, facial neuralgia, and maniacal irritation the operation has failed to produce results, though but few cases have been subjected to operation.

From my own simple observation, and from a study of the works of those whose experience with the operation has been extensive, I can make the following conclusions:

1. That as surgical treatment is recognized as the most satisfactory in exophthalmic goitre, so is complete bilateral cervical sympathectomy to be considered the operation of choice.

2. The operation should not be performed during the height of psychical irritation or tachycardia, nor by an operator who has not an absolute knowledge of the anatomy of the neck and a large experience in dealing with difficult operative procedures, or the means at hand to cope with any emergency.

3. The results of the operation are far better than the other procedures, the mortality is much lower, and in cured cases the improvement is permanent.

4. In chronic glaucoma, especially after the failure of iridectomy and sclerotomy, this operation may restore vision completely, unless the disease is too far advanced with absence of light perception.

5. In recurring attacks of epilepsy, sympathectomy should be resorted to. The results warrant the operation.